UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Offic
Address: COMMISSIONER OF PATENTS AND TRADEMARKS
Washington, D.C. 20231

M6

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR		ATTORNEY DOCKET NO.
09/362,397	07/28/99	KUGLER	E	H60-056DIV

IM52/0426

NOTARO & MICHALOS PC
EMPIRE STATE BUILDING
350 FIFTH AVENUE
SUITE 6902
NEW YORK NY 10118-6985

EXAMINER	
MCDONALD, R	
ART UNIT	**PAPER NUMBER**
1753	5

DATE MAILED: 04/26/01

Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trad marks

PTO-90C (Rev.11/00)

1- File Copy

Office Action Summary	Application No. 09/362,397	Applicant(s) Kugler	
	Examiner Rodney McDonald	Art Unit 1753	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136 (a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1) ☐ Responsive to communication(s) filed on ______.

2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.

3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11; 453 O.G. 213.

Disposition of Claims

4) ☒ Claim(s) *54-66, 76, 77, and 81-89* is/are pending in the application.

4a) Of the above, claim(s) ______ is/are withdrawn from consideration.

5) ☐ Claim(s) ______ is/are allowed.

6) ☒ Claim(s) *54-66, 76, 77, and 81-89* is/are rejected.

7) ☐ Claim(s) ______ is/are objected to.

8) ☐ Claims ______ are subject to restriction and/or election requirement.

Application Papers

9) ☐ The specification is objected to by the Examiner.

10) ☐ The drawing(s) filed on ______ is/are objected to by the Examiner.

11) ☐ The proposed drawing correction filed on ______ is: a) ☐ approved b) ☐ disapproved.

12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. § 119

13) ☐ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d).

a) ☐ All b) ☐ Some* c) ☐ None of:

1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ______.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

*See the attached detailed Office action for a list of the certified copies not received.

14) ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).

Attachment(s)

15) ☐ Notice of References Cited (PTO-892)

16) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

17) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s). ______

18) ☐ Interview Summary (PTO-413) Paper No(s). ______

19) ☐ Notice of Informal Patent Application (PTO-152)

20) ☐ Other:

DETAILED ACTION

Election/Restriction

1. Applicant's cancellation of the non-elected claims for possibly filing a divisional application is recognized by the Examiner.

Claim Rejections - 35 U.S.C. § 112

2. Claim 88 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 88 is indefinite because claim 76 does not require a "z" subscript.

Claim Rejections - 35 U.S.C. § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 54, 59, 60, 62-66, 68, 77 and 82-88 are rejected under 35 U.S.C. 103(a) as being unpatentable over Imaino et al. (EP 0 658 885) in view of Takurou et al. (JP-59003017), IBM Tech. Disclosure Bulletin, Vol. 28, pg. 301 or Ishihara et al. (U.S. Pat. 4,329,699).

Imaino et al. teach in Fig. 2A a cross-sectional view of medium 12. Medium 12 has a substrate 50. Substrate 50 is also known as a face plate or cover plate and is where the laser

beam enters medium 12. Face plate 50 and substrates 56, 62, 68 and 74 are made of a light transmissive material such as polycarbonate or other polymer material or glass. (Page 4 lines 3-14)

Fig. 2B is a cross-sectional view of an alternative embodiment of a highly transmissive optical recording medium and is designated by the general reference number 120. Elements 120 which are similar to elements of medium 12 are designated by a prime number. Medium 120 does not have the rims and spaces 78 of medium 12. Instead, a plurality of solid transparent members 122 separates the substrates. In a preferred embodiment, the members 122 are made of a highly transmissive optical cement which also serves to hold the substrate together The thickness of members 122 is preferably approximately 10-500 microns. Medium 120 may be substituted for medium 12 in system 10. Medium 120 may also be made of different numbers of data surfaces by adding or subtracting substrates and transparent members. For example, a two-data surface medium comprises face plate 50', member 122 and substrate 56'. (Page 4 lines 35-44)

Fig. 3A shows a detailed cross-sectional view of a portion of disk 12 of Fig. 2A. Substrate 50 contains the embedded information in the data surface 90 and is covered by a thin film layer 124. Layer 124 is made of a material which exhibits low light absorption at or near the wavelength of a light used in the optical system. For light in the range of 400-850 nm in wavelength, materials such as semiconductors are used for layer 124. The thickness of thin film

layer 124 is in the range of 25-5000 angstroms. Layer 124 is preferably spin coated onto surface 90. (Page 4 lines 45-50)

Fig. 3B shows a detailed cross-sectional view of a portion of the disk 120 of Fig. 2B. The layers 124' are deposited onto data surfaces 90' and 92', respectively. The member 122 separates the layers 124'. There is no need for a protective layer int his embodiment because member 122 serves as the protective layer. (Page 5 lines 5-8)

The thin film layers 124 are used to provide desired amounts of light reflectivity at each data surface. However, because there are multiple data surfaces through which the light passes the thin layers 124 must also be highly transmissive and absorb as little light as possible. These conditions can be met when the index of refraction (n) is greater than the extinction coefficient (k) and particularly when the index of refraction (n) is relatively high ($n > 1.5$) and the extinction coefficient (k) is relatively low ($k < 0.5$). Such conditions occur in certain materials over certain frequency ranges. One region where these conditions can be met is on the high wavelength side of an anomalous dispersion absorption band. (Page 5 lines 9-15)

Amorphous silicon has been found to be a good material for use as layer 124 where light in the wavelength range of 400 - 850 nm is used. (Page 5 lines 24-25)

Other semiconductor materials in addition to amorphous silicon may e used for layer 124. Any of group IVA elements from the periodic table may be used such as C, Si, Ge, Sn, Pb or combinations thereof. (Page 5 lines 30-31)

These semiconductor materials are deposited as layer 124 in a sputtering process. (Page 5 line 39)

The differences between Imaino et al. and the present claims is that the controlling of the amount of C or H that is present in the SiC or SiCH is not discussed.

Takurou et al. teach the manufacture of a titled film whose electric characteristics can be controlled over a wide range by sputtering an Si target with a gaseous mixture prepared by adding gaseous H2 to gaseous Ar and gaseous C3H8 or CH4 so as to stabilize the operation. A substrate 2 for forming an a-SixC1-x:H film (amorphous silicon carbide film stabilized with hydrogen) and an Si target 3 as an Si source are placed opposite each other in a reaction chamber 1.. The chamber 1 is evacuated 4, and a gaseous mixture consisting of gaseous C3H8 or CH4 6 as c and H sources, gaseous Ar and Gaseous H2 8 is fed to the chamber 1 through a mixer 9. At the same time, high-frequency voltage is applied to the space among a coil 10 for a magnetic field placed around the chamber 1, the substrate 2 and the target 3 from a high-frequency power source 11 to sputter the target 3 with said gaseous mixture. By the sputtering the a-SixC1-x:H film is formed on the substrate 2. (See Abstract)

The motivation for controlling the gas flows is so that a film of a-SixC1-x:H can be deposited. (See Takurou et al. discussed above)

IBM Tech. Disclosure Bulletin teach a process which is suitable for low temperature deposition of silicon carbide. The technique is reactive magnetron sputtering of silicon in a gas mixture containing argon and methane (or other carbon-containing gas). A planar magnetron

sputter RF source is used since it provides high rate sputtering with minimum substrate heating. This allows the films to be deposited for example on poly (methyl methacrylate) (PMMA) substrate without any adverse effect on such plastic substrate. By controlling the partial pressure of methane (or other carbon containing gas), we are able to deposit films with different silicon-to-carbon ratio (as revealed by ESCA analysis) and wider range of hydrogen content,; i.e., amorphous thin films obtained can be well represented as a SiC:H. These films have similar properties (optical, structural) to those for the films prepared using other high temperature techniques. (See Abstract)

The motivation for controlling the gas is that it is desired to control the silicon-to-carbon ratio. (See Abstract)

Ishihara et al. teach forming amorphous silicon carbide through a sputtering process. A vacuum apparatus as schematically shown in Fig. 12 is used for fabricating the heterojunction device by sputtering amorphous silicon and amorphous silicon carbide. In the figure, there are illustrated electrodes 56 and 58, a substrate 55 on which the material is deposited, a substrate 57 which is to be sputtered, and a valve 59 for feeding a desired mixture gas to the interior of a bell jar 54. In order to form the amorphous silicon layer and the amorphous silicon carbide layer by sputtering, the interior of the bell jar 54 is first evacuated and the mixture gas is then introduced into the bell jar via valve 59, the mixture gas containing an inert gas, hydrogen, a gas of hydrocarbon system such as methane and in a case of addition of impurities an additional gas such as phosphine or diborane. Thereafter, DC voltage or one to ten and several MHZ high frequency

voltage is applied across the electrodes 56 and 58 to place the interior of the bell jar 54 into plasma condition. Used in the process are about 1 to 3 KV applied voltage, 100 to 300 mA current, and 50 to 500 W power consumption. Under these conditions, the vapor deposition rate can be controlled to 0.2 to 2 Angstroms/sec to sputter silicon. (Column 10 lines 25-50)

As described above, in the heterojunction device wherein amorphous silicon and amorphous silicon carbide having different forbidden band widths are sputtered to form semiconductor thin films, the forbidden band width can be controlled by simply varying composition of silicon and carbon in silicon carbide. (Column 11 lines 24-31)

The composition can easily be varied by simply varying partial pressure of the hydrocarbon system. (Column 11 lines 40-42)

The motivation for controlling the gas is that it is desired to control the composition of the deposited film. (Column 11 lines 40-42)

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified Imaino et al. by controlling the amount of C or H that is present in the SiC or SiCH as taught by Takurou et al., IBM Technical Disclosure Bulletin and Ishihara et al. because it allows for control of the composition of the film such as the ratio of silicon to carbon.

5. Claims 55, 56 and 61 are rejected under 35 U.S.C. 103(a) as being unpatentable over Imaino et al. in view of Takurou et al., IBM Tech. Disclosure Bulletin, Vol. 28,

pg. 301 or Ishihara et al. as applied to claims 54, 59, 60, 62-66, 68, 77 and 82-88 above, and further in view of Kugler (U.S. Pat. 5,292,417).

The differences not yet discussed is the AC superimposed on DC, feedback control and doping.

Kugler teach a method and apparatus for preforming the method comprising a vacuum treatment chamber containing a target of ohmic conductive material. The target and a workpiece are supported by suitable electrodes. Superimposed DC and AC power is applied to the target to generate a glow discharge in the chamber in which the target is sputtered. Particles sputtered off the target react with a reactive gas in the space between the target and workpiece and the reaction product is deposited upon the workpiece. (See Abstract)

It has been recognized that, principally, when reactive AC and DC sputtering a target of low electric conductivity, such as and especially as of Si, which is doped in order t o increase its conductivity, doping be phosphorus leads to a significantly lower tendency of arcing and splashing at a "poisoned" target. (Column 6 lines 63-68)

According to the schematic illustration, a negative feed back control circuit for stabilizing sputtering and coating process is provided. It includes an actual value sensing device 22, including one or several sensors of the following, optical sensor, absorption-emission-fluorescence spectrographic sensor, sensor for detecting light emission, plasma monitoring sensor, discharge impedance sensor, partial pressure sensor. (Column 12 lines 25-37)

The output signal of the actual value sensing device 22 is sent to a conditioning and evaluating unit 24, 26. After the signal has been conditioned, the actual value signal S is led to a difference measuring unit 28. Here the control difference relative to a preset rated value W is generated, which latter may be set by unit 30. (Column 12 lines 38-43)

The control difference acts via controllers (not illustrated) for optimizing the control of a process value, i.e. the regulated value, and which reacts speedily. Preferably one or several of the following physical values listed below are used as the regulated value and are set by respective regulating means: DC power, AC frequency, AC frequency, AC frequency spectrum, ratio of AC power/ DC power, mass flow of reactive gas, gas mixture, mass flow of process gas. (Column 12 lines 44-58)

The motivation for superimposing AC over DC, providing negative feedback control and providing a doped target is that it allows for production of high quality coatings. (Column 7 line 15)

Therefore, it would have been obvious to one of ordinary skill in the art to have superimposed AC over DC during deposition, utilized negative feedback control and doped the silicon target as taught by Kugler because it allows for production of high quality coatings.

6. Claims 57 and 58 are rejected under 35 U.S.C. 103(a) as being unpatentable over Imaino et al. in view of Takurou et al., IBM Tech. Disclosure Bulletin, Vol. 28, pg. 301 or Ishihara et al. and further in view of Kugler as applied to claims 54-56, 59, 60, 61-66, 68, 77 and 82-88 above, and further in view of Signer et al. (EP 0 564 789).

The differences not yet discussed is applying a pulsating AC voltage and intermittently connecting the carrier to different voltage paths.

Signer et al. teach a method of treating a workpiece in a vacuum atmosphere in which ions are produced and driven against the at least partially insulated surface (4) of a workpiece (2b) and cause electrostatically charged surface, a short circuit between the partially insulated workpiece and the other conductive surface is intermittently produced to neutralise collected charge on the insulated layer. The neutralised ions remain accumulated on the surface and are suitable for ion plating. In sputter coating and etching processes. (See Abstract) The Figures demonstrate providing pulsing AC power and intermittently connecting the carrier to different voltage paths. (See Figures)

The motivation for utilizing a pulsating AC voltage and intermittently connecting the carrier to different voltage paths is that it avoids the need for expensive high frequency generators to be included in the circuit to neutralize the electrostatic charge. (See Abstract)

Therefore, it would have been obvious to one of ordinary skill in the art to have applied a pulsating AC voltage and intermittently connected the carrier to different voltage paths as taught by Signer et al. because it is desired to neutralize electrostatic charge.

7. Claim 81 and 89 is rejected under 35 U.S.C. 103(a) as being unpatentable over Imaino et al. in view of Takurou et al., IBM Technical Disclosure Bulletin or Ishihara et al. as applied to claims 54, 59, 60, 62-66, 68, 77 and 82-88 above, and further in view of Tawara et al. (EP 0 473 492).

The differences not yet discussed is the use of a reflection layer.

Tawara et al. teach an improvement in the stability and durability can be obtained in a magneto-optical recording medium having a multi-layered structure consisting of a transparent substrate plate, a first dielectric layer, a magnetic layer, a second dielectric layer and a reflecting layer by providing a protective coating film on the surface of the substrate plate opposite to the first dielectric layer with an inorganic substance selected from the group consisting of silicon nitride, silicon carbide, Titanium dioxide, indium-tin oxide, silicon nitride containing hydrogen, silicon carbide containing hydrogen, silicon nitride containing hydrogen, calcium fluoride and magnesium fluoride. (See Abstract)

The reflection layer can be aluminum, copper, gold, silver and the like. (Column 3 lines 12-15)

The motivation for utilizing a reflecting layer is that it is desired to improve the layers stability and durability. (See Abstract)

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have used a reflection layer as taught by Tawara et al. because it is desired to improve the layers stability and durability.

8. Claim 76 is rejected under 35 U.S.C. 103(a) as being unpatentable over Imaino et al. (EP 0 658 885) in view of Tawara et al. (EP 0 473 492) and Kim et al. (U.S. Pat. 5,240,581).

Imaino et al. is discussed above and all is as applied above. (See Imaino et al. discussed above)

The differences between Imaino et al. and the present claims is that silicon nitride is not discussed and sputtering to form the silicon nitride is not discussed.

Tawara et al. is discussed above and all is as applied above. Tawara et al. suggest silicon nitride. (See Tawara et al. discussed above)

The motivation for utilizing silicon nitride is that it allows improvement in stability and durability of the magneto-optical recording medium. (See Tawara et al. discussed above)

Kim et al. teach formation of a silicon nitride layer by sputtering in a nitrogen atmosphere for a magneto-optical recording medium. (Kim et al. Column 4 lines 10-22)

The motivation for depositing a silicon nitride layer in recording medium is that it allows for use of a layer with consistent refractive index. (Column 1 lines 64-68; Column 2 lines 1-2)

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified Imaino et al. by utilizing silicon nitride as taught by Tawara et al. and to have deposited the silicon nitride by sputtering as taught by Kim et al. because it allows for a layer in recording medium that is stable, durable and has a consistent refractive index.

Response to Arguments

9. Applicant's arguments filed 2-20-01 have been fully considered but they are not persuasive.

RESPONSE TO THE ARGUMENTS OF THE 35 U.S.C. 112 2ND PARAGRAPH REJECTION OF CLAIMS 55, 64, AND 88:

The 35 U.S.C. 112 2nd paragraph rejections of claims 55 and 64 have been withdrawn.

The 35 U.S.C. 112 2nd paragraph rejection of claim 88 remains because the subscript "z" is not in claim 76 thus leading to an antecedent basis problem.

RESPONSE TO THE ARGUMENTS OF THE 35 U.S.C. 103 REJECTION OF CLAIMS 77, 54, 59, 60, 62-66 AND 82-88 AS OBVIOUS OVER IMAINO ET AL. IN VIEW OF TAKUROU ET AL., IBM TECH. DISCLOSURE BULLETIN OR ISHIHARA ET AL.:

In response to the argument that Imaino et al. does not appear to use SiC or SiCH or even SiN at all, it is argued that at page 5 lines 30-31 Imaino suggest that in place of amorphous silicon any of the group IVA elements may be used such as **C**, **Si**, Ge, Sn, Pb and **combinations thereof** for the layer 124. This suggests the combination - **SiC**. Applicant references page 5 lines 32-34 which cites a formula that requires group IIIA and VA elements. This is another option to be used in place of the amorphous silicon layer. The Examiner reads the passage to have three options 1) amorphous silicon; 2) Group IVA elements and combinations of those elements (i.e. SiC); 3) Combinations of Group IIIA and Group VA elements including alloys having the formula

listed at lines 33-36. Therefore, Imaino suggest the claimed SiC required by the pending claims. (See Imaino et al. discussed above)

In response to the argument that the skilled artisan would have no motivation to combine the secondary references with Imaino et al. because it the secondary references make other products with different requirements, it is argued that the secondary references were relied upon only to teach controlling the gas flow which effects the composition of the deposited films. Imaino et al. recognize that deposited films containing Si and C can be used in layers of a data storage system. (See Imaino et al., Takurou et al., IBM Tech. Disclosure Bulletin and Ishihara et al. discussed above)

RESPONSE TO THE ARGUMENTS OF THE 35 U.S.C. 103 REJECTION OF CLAIMS 55, 56 AND 61:

In response to the argument that one would not be motivated to combine Kugler with Imaino, it is argued that the motivation for combining Kugler with Imaino is that it allows for production of high quality coatings for sputtering. (See Kugler and Imaino et al. discussed above)

RESPONSE TO THE ARGUMENTS OF THE 35 U.S.C. 103 REJECTION OF CLAIMS 57 AND 58:

In response to the argument that Signer does not provide the necessary teachings to be combined with the other references, it is argued that Signer does provide the necessary teaching as required by the claims with the motivation of neutralizing electrostatic charge. (See Signer discussed above)

RESPONSE TO THE ARGUMENTS OF THE 35 U.S.C. 103 REJECTION OF CLAIMS 81 AND 89:

In response to the argument that Tawara in combination with Imaino and the secondary references does not suggest the limitations of claims 81 and 89, it is argued that Tawara do provide the necessary teaching of providing a reflection layer to improve layer stability and durability. (See Tawara discussed above)

RESPONSE TO THE ARGUMENTS OF THE 35 U.S.C. 103 REJECTION OF CLAIM 76 AS OBVIOUS OVER IMAINO IN VIEW OF TAWARA OR KIM:

In response to the argument that there is no motivation in Imaino or in Tawara or Kim to deposit SiN in the intermediate layer between the two information interfaces, it is argued that Imaino teach depositing SiC in storage medium. Tawara and Kim also suggest utilizing SiN in the recording medium. (See Imaino, Tawara and Kim discussed above)

Conclusion

10. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37

CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Rodney McDonald whose telephone number is (703) 308-3807.

Rodney G McDonald

RODNEY G. MCDONALD
PRIMARY EXAMINER

RM

April 25, 2001